

AVIAN THERAPEUTICS

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General Guidelines

Although avian therapeutics and drug dosages are available from many sources, including scientific articles and formularies in certain avian texts, drug dosages in birds are poorly established. Most drugs used in avian medicine have not been tested in pharmacologic studies; rather, the dosages are generally empirically based or based on clinical experience.

It is important to note that drugs that are effective in certain avian species may be inappropriate or toxic in others. Further, in the critically ill bird, stabilization of the bird is essential: Antibiotic therapy alone is not adequate. Before beginning diagnostic testing or treatments in any bird, the avian veterinarian needs to evaluate the hydration status and condition of the bird to determine if fluid therapy and/or nutritional support is needed.

Selection of rational drug therapy is dependent upon several factors, including the condition of the bird, diagnostic findings, culture and sensitivity results, and the capability of the owner to medicate the bird. Although injectable medications are the ideal means of treating a bird, quite frequently the owner is reluctant to treat the bird in this fashion. Oral administration is the next best technique and the means most often employed in avian practice. It takes some time to teach clients how to medicate a bird, but once they have become adept at the procedure they can administer an accurate, measured dose.

Most medications given in drinking water generally are not as effective as those given by injection or oral treatment. Not only does medication in drinking water lose potency over time, but it also may discolor the water and cause it to be distasteful, which will lead to nonacceptance by the bird. For birds that are ill and perhaps dehydrated, this situation could lead to further deterioration of their condition. Still another factor is the variable water consumption of birds; one can never be certain that birds are achieving therapeutic levels of drugs that have been administered in their drinking water. Nonetheless, medicated water makes it easy to treat birds on a flock or aviary basis and is often the only means of treating an overtly wild or aggressive bird. If medications are given through the drinking water, bird owners should be instructed to limit foods that have a high water content, such as fruits and vegetables, to prevent the bird's avoidance of the medicated water due to hydration via the food.

GUIDELINES FOR SPECIFIC DRUG CATEGORIES

Antimicrobial Agents

Antimicrobials may be the most abused and the most useful class of drugs available to the veterinary practitioner. They are used to treat bacterial disease, which is one of the most common medical problems seen in pet birds. Although primary bacterial infections

do occur, secondary infections due to poor husbandry practices and immunosuppression are more common. Poor husbandry can expose birds to large numbers of potentially pathogenic organisms from environmental sources and other birds. Malnutrition, stress, medications, or concurrent disease may result in immunosuppression, leading to increased susceptibility to potential pathogens. Bacterial disease management in pet birds thus involves determining the causes or sources of the infections, correcting poor husbandry practices, and treating with appropriate antimicrobial therapy.

Bacterial culture and sensitivity are extremely important parts of the avian diagnostic workup. In seriously ill birds, such testing should be conducted as quickly as possible.

The antimicrobials used most often in pet birds are aminoglycosides, cephalosporins, enrofloxacin, penicillins, tetracyclines, and trimethoprim-sulfonamide combinations.

Aminoglycosides. Aminoglycosides are bactericidal, are confined to the extracellular space, poorly penetrate the eye and central nervous system, and are excreted through the kidneys. They are not absorbed from the gastrointestinal tract, so they must be administered parenterally (by injection). They are relatively toxic in relation to other antibiotics, potentially causing nephrotoxicity (toxic to kidneys), ototoxicity (toxic to ears), and other neurologic dysfunction. Thus, they should be used with caution in dehydrated birds or birds with renal disease.

Aminoglycosides have excellent activity against most gram-negative bacteria and *Staphylococcus* but poor activity against most *Streptococcus* and anaerobes. Gentamicin, tobramycin, and amikacin are the aminoglycosides commonly used in avian practice. Amikacin is preferred, as it is the least nephrotoxic. Gentamicin can be used to reduce expense or to treat amikacin-resistant organisms. It is available in several topical ophthalmic preparations that are useful in pet birds. Due to the nephrotoxicity of gentamicin, the condition of a bird under treatment should be carefully monitored. Tobramycin has good activity against *Pseudomonas*.

Aminoglycosides work well in combination with penicillins and cephalosporins, so both groups of drugs are potentiated when they are used together. Treatment with aminoglycosides can be administered once or twice a day. As noted above, the drawbacks for their usage are their potential nephrotoxicity and the need to use parenteral administration.

Cephalosporins. Cephalosporins (Cephalexin, Keflex, Claforan) are bactericidal and are widely distributed to the extracellular space but poorly penetrate the central nervous system or abscessed tissue. They are excreted through the kidneys and are considered less toxic than many other antibiotics. Their low toxicity is advantageous for birds with compromised hepatic or renal function.

Cephalosporins are classified into first-, second-, and third-generation products, with differing spectra of activity. Cephalothin and cephalexin are first-generation antibiotics and are effective against many gram-positive and some gram-negative bacteria. The later

generations have increased activity against gram-negative bacteria but reduced activity against gram-positive bacteria. Cefotaxime is effective against *Pseudomonas* and has a further advantage of being able to penetrate the blood-brain barrier, thereby achieving therapeutic levels in the central nervous system. Cefotaxime is synergistic with aminoglycosides, so both drugs are potentiated when used in combination. A disadvantage to cephalosporin use is the frequent dosing required to maintain therapeutic levels.

Quinolones. Enrofloxacin (Baytril, Cipro) is bactericidal, widely distributed, and excreted primarily through the kidneys. It is well tolerated orally, but intramuscular injections can be irritating. It is one of only a few antibiotics that are effective when administered in the drinking water.

Highly effective against most gram-negative bacteria and some gram-positive bacteria with once or twice daily dosing, enrofloxacin has no activity against anaerobes. Unfortunately, many avian practitioners overuse enrofloxacin, employing it for almost any disease condition. A disadvantage of enrofloxacin is its relative inactivity against many *Streptococcus* spp. and all anaerobes. Another problem is that it is unpalatable, so that birds will often refuse oral administration. Disguising the taste with fruit juice or some type of flavoring is sometimes helpful for acceptance.

Penicillins. Penicillins (Amoxicillin, Piperacillin) are bactericidal and widely distributed to the extracellular space but poorly penetrate the central nervous system. They are excreted through the kidneys and are considered less toxic than many other antibiotics. As with cephalosporins, their low toxicity is advantageous for birds with compromised hepatic or renal function.

The spectrum of activity and route of administration vary with the particular penicillin drug. Ampicillin and amoxicillin are available in both oral and injectable forms and are effective against many gram-positive but few gram-negative organisms. Later generation penicillins such as ticarcillin and piperacillin have effectiveness against gram-negative bacteria, including *Pseudomonas*, as well as gram-positive bacteria, but are available in injectable form only. Early generation penicillins are not very effective for most avian pathogens, but later generation penicillins with their enhanced effectiveness against gram-negative bacteria are more useful.

When penicillins are used in combination with an aminoglycoside, such as amikacin, potentiation of both drugs occurs. A disadvantage to the use of penicillins is the frequent dosing required to maintain therapeutic levels.

Tetracyclines. Tetracyclines (Tetracycline, Doxycycline) are bacteriostatic with wide tissue distribution. Unlike most other antibiotics, the route of excretion varies from drug to drug. Oral preparations have reduced absorption in the presence of calcium and magnesium. Injectable forms can be irritating and cause necrosis at the injection site. Long-term treatment may lead to immunosuppression and lower the normal gut flora, leading to the development of opportunistic infections, such as candidiasis.

Tetracyclines can be used to treat a variety of organisms, but their primary use in avian medicine is for the treatment of chlamydiosis, with doxycycline being the drug of choice. Unlike most tetracyclines, doxycycline is minimally affected by calcium, and fungal overgrowth is less likely. Treatment of chlamydiosis has been accomplished through injectables, oral dosing, and addition to food and water with variable success. Tetracyclines can be used in combination with bactericidal drugs to treat bacterial septicemia and chlamydiosis.

Trimethoprim-Sulfonamide Combinations. Trimethoprim-sulfonamide combination drugs (Septra, Bactrim) are bacteriostatic, have good tissue penetration, and are excreted through the kidneys. Careful monitoring should be conducted, since sulfonamides can cause renal damage in dehydrated birds.

Trimethoprim-sulfonamide combinations have good efficacy against many gram-positive and gram-negative bacteria except for *Pseudomonas*. They are available in oral and injectable forms. The oral form is usually tolerated well; however, some birds may develop gastrointestinal upset or vomiting after administration, particularly macaws. The injectable form can cause irritation at the injection site. Trimethoprim-sulfamethoxazole is the most common combination of drugs in this category used in birds, as it has excellent broad-spectrum activity. The main disadvantages to trimethoprim-sulfonamide combinations are their potential to cause regurgitation and the possibility of renal damage in debilitated birds.

Antifungal Agents

Fungal diseases are among the most frustrating avian infections to diagnose and treat. *Aspergillus* is found throughout the environment, and quite often aspergillosis is the result of poor husbandry practices. Chronic fungal diseases involving *Aspergillus* spp. and *Candida albicans* are often due to immunosuppression. Occasionally, secondary bacterial infections will complicate a fungal condition. Due to the nature of the fungal organisms and the pathological changes they produce in the tissues, it is difficult to achieve therapeutic levels of antifungal agents in affected tissues, decreasing treatment success. Thus, treatment of fungal infections requires long-term therapy and is expensive. With the use of newer antifungal drugs, such as fluconazole (Ancobon) and itraconazole (Sporonox), better success has been achieved in treatment. African greys seem to have a sensitivity to itraconazole, so quite often terbifine (Lamisil) is used to treat *Aspergillus* in these birds. Due to the potential side effects of antifungal agents, the general health status of the bird should be carefully monitored.

Antiparasitic Agents

The misuse of antiparasitic and antiprotozoal drugs, especially in poultry, has resulted in many effective drugs being removed from the market. Most dosages for drugs that are available were developed for poultry. Since some of these drugs can be toxic, close supervision of a bird during treatment is important. Droppings should be checked to be certain that the bird is free from parasites. In addition to drug therapy, management of the environment is an important part of the treatment plan. Reduction in vermin and vector

contact with birds, a clean aviary, quarantine, and post-purchase physical examination of new birds are important preventative measures to maintain an aviary free of parasites.

Nebulizing Agents

Nebulization therapy is an effective treatment for respiratory disease in pet birds. Conditions such as air sacculitis are difficult to treat without nebulization: Because of the poor blood supply in birds' air sacs, most drugs administered orally or parentally fail to reach therapeutic levels. Nebulization can deliver therapeutic agents into the lungs and air sacs, thereby facilitating treatment. Bacterial and fungal infection treatment regimens are often enhanced with the use of nebulization.

Psychotropic Agents

Behavioral problems in avian medicine are frustrating for the practitioner and bird owner alike. Over the past few years, there has been an increasing trend to control such problems as feather picking and other unwanted behaviors with psychotropic agents. The use of these drugs has been based on work with mammals and usage in pet birds by avian practitioners. Psychotropic agents should be used with caution due to their many potential side effects. Medical causes for any behavioral abnormalities should be explored and behavior modification techniques employed before psychotropic agents are administered.

Topical Agents

Topical medications should be used cautiously and applied sparingly. Any preparation, especially creams and ointments, that is applied too heavily or carelessly can be rapidly distributed throughout the feathers as the bird preens, resulting in oily, greasy, or matted feathers. This decreases the insulating property of the feathers and may result in feather loss. Ointments and creams should not be applied directly to the feathers. Instead, they should be applied conservatively to unfeathered parts of the body. If a lesion must be treated in a feathered area, the medication should be applied carefully and treatment stopped if the feathers become oily or greasy. Application of mild detergents can remove these medications from the feathers. Ophthalmic ointments should be used sparingly to avoid feather loss around the eyes. Any excess medication around the margins of the eyes should be blotted up. Steroidal ointments have been implicated in systemic absorption with harmful side effects, so they should be used with caution.

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